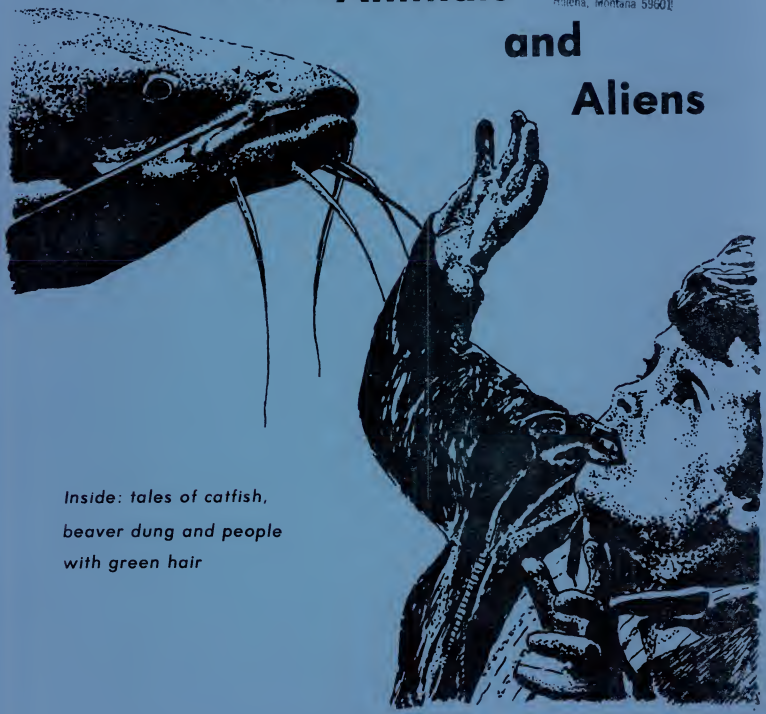
Big Sky Clearwater

VOL. X SUMMER ISSUE 1980 No. 2

Animals and Aliens



Inside: tales of catfish, beaver dung and people with green hair

Groundwater: state's fragile resource

It's threatened by dumpsite leachate

By Bill Potts
Montana Solid Waste Bureau

SIXTY-TWO PERCENT of Montana's population are dependent on groundwater for their domestic water supply. More than 470,000 Montanans use at least 105,000 acre-feet of groundwater a year (an acre-foot equals 325,000 gallons). Because it's more economical to develop groundwater, a far greater number of domestic water systems in the state are supplied by groundwater rather than surface water.

Groundwater reservoirs, used so extensively throughout the state, can be very fragile. But because it's hidden, a groundwater supply can be polluted for a long time before anyone notices, and by then the damage can be quite severe.

Groundwater generally moves at a slow velocity with different mixing characteristics than water found in more turbulent surface streams. A pollutant that percolates into the ground has a tendency not to dilute with the surrounding groundwater. An injected liquid, therefore, generally moves, as a slug or plume, with the same velocity as the groundwater flow, but undergoes very little mixing.

Montana communities have developed mostly in or near river valleys. Sand and gravel aquifers, often carrying large volumes of groundwater near the surface, typically are found in such valleys. So are town dumps. Such dump sites, often in "useless" areas such as gullies, can bring together the groundwater and the pollutants from municipal refuse.

Right now, many disposal sites throughout the state still are located in areas that significantly increase the potential for contamination of groundwater resources from our solid wastes.

There is a growing concern about groundwater pollution. People know that once groundwater is degraded, it's much harder to clean up than surface water.

LEACHATE results from water flowing through decomposing waste. If not controlled, leachate can leave a disposal site and contaminate ground and surface waters.

Solid waste consists of organic and inorganic matter as well as living organisms. At the time of disposal, certain biological actions initiate the decay process of organic material. Microorganisms quickly deplete the supply of oxygen and the solid waste becomes anaerobic (absence of oxygen). Organisms that thrive in this type of atmosphere continue the decomposition of the waste but produce considerably different end products than found in the first phase of decay.

The anaerobic forms of sulfur, nitrogen, iron and manganese usually are found in abundance in leachate. It should be noted that the formation of leachate, to a large extent, is dependent upon certain conditions such as volume of waste and amount of moisture that passes through the solid waste.

SELECTED ELEMENTS' EFFECTS UPON BENEFICIAL WATER USES

Iron

Iron can affect the taste of water and can stain laundered clothes and plumbing fixtures. Iron at high concentrations has been reported to be toxic to livestock.

Zinc

At a concentration of 30 mg./l, zinc gives water a milky appearance and causes a greasy film upon boiling. Soluble salts of zinc have an unpleasant taste and can be detected at fairly low levels.

Cadmium

Cadmium has been shown to be toxic to

COMPONENTS OF LEACHATE RECENTLY

FOUND IN A MONTANA MUNICIPAL DISPOSAL SITE

Elements	Amount (mg./l)	Interim Primary/Proposed Secondary Drinking Water Standards (maximum level) (mg./l)
Iron	175.0	0.3
Copper	0.05	1.0
Zinc	600.00	5.0
Cadmium	0.02	0.01
Arsenic	0.06	0.05
Manganese	1160.0	0.05
Nitrites	0.03	
Nitrates	0.46	10.0
Sulfates	4847.0	250.0

man. Drinking water containing excessive cadmium can lead to the occurrence of itai-itai disease. This disease is characterized by rheumatic symptoms with intense pain in the bones with the bones becoming as flexible as soft tissues. Chronic kidney disease also can result from the critical concentration of cadmium in the kidneys. Fish have been found to be sensitive to low levels of cadmium in water.

Arsenic

Taken in relatively small amounts, arsenic can be toxic to man. Arsenic accumulates in the body so that small doses can become fatal over time. The presence of excessive soluble arsenic in irrigation waters will reduce the yield of crops.

Manganese

Manganese is considered relatively non-toxic to man because before toxic concentrations are reached in water, the taste becomes quite unpleasant. At concentrations above .05 mg/l, manganese will leave a brownish stain on laundry and have an objectionable taste.

Nitrites, Nitrates

Serious and occasionally fatal poisonings in infants have occurred following ingestion of polluted well waters shown to contain nitrate at concentrations greater than 10 mg/l as nitrogen.

Sulfates

At higher concentrations, sulfate compounds may leave an unpleasant taste to water and can be a strong contributor to rates of corrosion of iron, steel and concrete. High concentrations hurt plants, and can be toxic or lethal to aquatic life.

LIVING ORGANISMS which can produce a serious risk to public health often are found in leachate. Fecal coliform and fecal streptococci have been identified in leachate, and polio virus has been observed in leachate from a simulated disposal site. Such bacteria can come from sewage sludge and septic tank pumpings which often are dumped in refuse disposal sites.

For leachate to be formed, water must move through the refuse in a disposal site. And, leachate is not produced until some portion of the refuse has reached field capacity (saturated with water). This may occur through precipitation, surface water infiltrating into the refuse, water percolating into the disposal site from adjacent land area, or groundwater in contact with refuse.

As such moisture, laden with leachate, percolates through the refuse, it

reaches what is called the unsaturated zone, the area between the bottom of a disposal site and the water table. The movement of leachate through this zone depends on the type of soil found in the area. Porous soils, such as sand, gravel or fractured rock, may allow a rapid movement of leachate to groundwater. On the other hand, soils of a clay nature will restrict such movement.

If leachate reaches an aquifer, it will be influenced by the movement of groundwater as well as the physical features of the aquifer. As already mentioned, the velocity of groundwater is relatively slow so that leachate tends to maintain its physical composition, and little dilution of the pollutant occurs. As such, the leachate will move with the groundwater as a plume. The shape of the plume is determined by the physical characteristics of the aquifer.

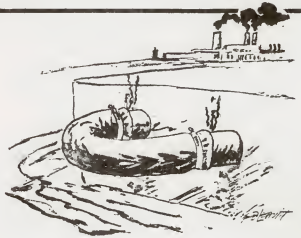
Potential hazards to groundwater quality from leachate depends upon numerous factors including: the amount and composition of the waste; the distribution of the waste on the land; and the amount of moisture infiltrating through the waste. Another important factor is the siting, design and actual operation of the disposal site. A well-designed and operated sanitary landfill located in an area with relatively impervious soils and with adequate distance from an aquifer will not impair the existing quality of groundwater. However, improperly operated and located disposal sites that are often open to external sources of water are likely to produce leachate in significant amounts.

In Montana, under certain circumstances, leachate formation can damage groundwater seriously and subsequently can damage surface water. Once an aquifer is contaminated by leachate, serious and long-lasting damage to the quality of the groundwater can occur, and this damage can spread over a considerable distance. Such contamination can greatly reduce the availability of groundwater in a given area. It has been found that remedial efforts to cleanse an aquifer can be extremely expensive and only partially successful.

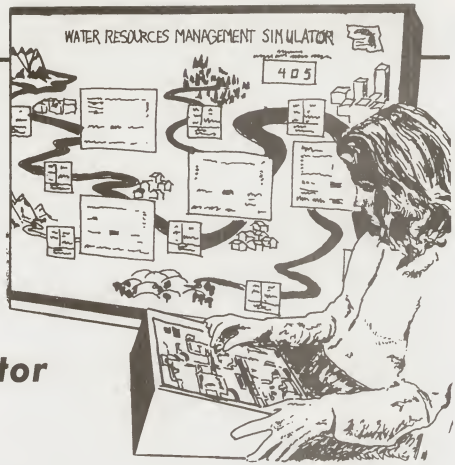
THROUGH a state licensing procedure, each disposal site in Montana is being evaluated for, among other things, the potential of groundwater contamination. Each site is evaluated for its proximity to groundwater and the permeability of the soils beneath the site. In this manner, the suitability of a site to accept solid wastes can be assured.

A properly located and managed sanitary landfill, where waste is compacted and covered daily with an adequate amount of cover material, will greatly minimize the potential threat of leachate contamination.

Additionally, the development of areawide waste management systems is a control measure which can greatly minimize the production of leachate from existing dumps and smaller disposal sites. Many local governments throughout Montana are working toward the development of such systems. These systems will concentrate the waste in centralized locations providing for the proper and economical disposal of our waste minimizing threat of groundwater contamination.



Water flow is studied by new simulator



From the Billings Gazette

A SERIES of red lights flashed across a large computer console in Bozeman, warning that a flow of carefully managed water was dwindling rapidly.

Switches were flipped and knobs turned in an effort to reverse the worsening situation, but the response fell short.

An overwhelming demand by various interests for water had depleted the resource and left a large river dry.

The consequences of such an occurrence in real life would be grave, of course, because water is an essential part of agriculture, industry, energy conversion, wildlife management, and much of everyday life.

Fortunately, with a computer simulation the system can be reset and a river easily replenished, but the lesson imparted is no less dramatic, says Dr. John Amend, developer of the new Water Resources Management Simulator.

"The problems of water resource management are not simple," said Amend, a professor of chemistry at Montana State University with a background in electrical engineering.

"We face problems of increasing demand for a limited and often variable resource. This is compounded by a lack of public understanding about some of the basic principles of hydrology."

The simulator, developed over the past 18 months by Amend and a team of MSU researchers, is designed to give the public actual "hands-on" experience with the problems and strategies of water management.

The interactive computer models the supply and demand for water in a particular region based on government data collected over a 30-year period.

The present model represents the Upper Missouri River region and depicts a high plains sub-basin, a grassland sub-basin, and a predominantly groundwater sub-basin.

Dr. John Amend:

The creator of the simulator

THE SIMULATOR is part of a public education program in water resource management sponsored by the Old West Regional Commission. The program will include workshops conducted by state water resource agencies in Montana, Nebraska, Wyoming and the Dakotas.

Participants in each workshop will operate the simulator's portable control consoles to enact strategies of water management policy. The participants will control such decisions as storage of surface and ground water, rate of water use, and sources of water.

They will be concerned with meeting demands created by irrigation, livestock, energy, cities and industry and inter-basin transfer.

Their decisions, and any lack of action, will be translated electronically with the computer projecting the probable consequences of various policies and strategies.

"It's an extremely effective way to learn things," Amend said. "It gives you the opportunity to 'live' with a complex problem in a fairly realistic form. And it's cost-effective because of how much you can accomplish in a short time."

The simulator was unveiled last year at the Council of State Governments Legislative Conference on Energy in Helena and later at the Montana Water Development Association meeting in Fairmont Hot Springs.

The Old West Regional Commission funded development of the simulator with a $130,000 grant. The Office of Water Research and Technology at MSU also provided support for the project.

"Although it's not particularly visible to many Americans, the problem of water resource is probably equal in importance to the widely publicized problems of energy resource, use and conservation," Amend said.

"One of the principal values of the simulator is its ability to place people in a decision-making situation involving real variables and alternatives," Amend said.

Amend designed the highly successful Energy-Environment Simulator used by the Department of Energy. More than 100 of the simulators have been produced and viewed by an estimated two million persons.

Although similar to the energy simulator, the Water Resources Management Simulator was more difficult to develop because of the addition of a microprocessor to each unit, Amend said.

They can also use the simulator for actual planning if they have information on a particular stream. The simulator can be calibrated for any sub-basin by a change in programming, Amend said. Thus it has practical application across the country.

Keep cool under fire, an operator suggests

By Dean A. Sloan
Miles City Street Superintendent
and Class II Water Operator

THE OPINION was expressed at the 46th Annual School for Water and Wastewater Operators that we are not appreciated enough by the very people we serve every day, or even by the Councils that run our cities and towns. It was also stated that "if some of those sons-a-bitches had been standing close by instead of using the phone to chew me out, I'd have decked them." I empathize with the man who made that statement but I do not agree with his attitude.

Our winter of 1978-79 in Miles City was no different than the winter any of the cities in Montana had. It was a long, hard winter. It was a winter that showed us the deficiencies in our systems. It was a winter that taxed our patience, drive and stamina. It was a winter that made us improvise and experiment. It was a winter that even caused my wife some grief because if I was not home when someone called with their problems, they would chew my wife out in lieu of me. But it was not a winter that made me forget just who it was that I was giving all of that overtime for.

Our business, yours and mine, is a service business. To compound that, ours is a service business that is not paid for "across the counter" but instead, it is paid for in a most hideous way, by taxes. We are under the gun the moment we go to work; before we do anything to bring any wrath down on us. We are government employees, whether it be City, County, State or Federal, and we are paid to do our job by every person we come in contact with, whether it is one of those "sons-a-bitches" mentioned above or the nicest, sweetest little old lady in town. They all deserve the same clean water and free-flowing sewer.

People do call our offices and homes and commence to chew us out when they have a problem. But there may be a reason for it. First of all, they don't call until they have a problem. When they do call someone, they may call the wrong office and when they have to call different offices they, in their anxious state, start getting the feeling they are being shuffled around and their anxiety turns to agitation.

With frozen water, or a frozen sewer, everything in a household is at a standstill. If you add that to the irritation of being "shuffled" from phone to phone, you can be sure that when the taxpayer gets the person cornered that is in charge of it all, the superintendent's attitude had better be good or the taxpayer may explode with all of these frustrations on that unsuspecting government employee.

EVERY SINGLE EMPLOYEE -- from the superintendents to the foremen to the operators to the laborers -- must realize that they serve in an industry where each person that they come in contact with pays their wages DIRECTLY. City employees cannot and should not dismiss complaints by the taxpayer or take their job lightly. We have a responsibility that goes far beyond the responsibilities incurred in the private sector. We cannot tolerate poor attitudes or rudeness in those we work with, in those we work for or those who work for us.

The responsibility we bear and the lack of recognition we get for day-to-day work we turn out as a matter of habit and the emergencies we handle with experience and expertise are not things that are going to change because we can "out-shout" our irate customers. Those are things that may never change. If they do change, however, it will be due to the professional way that we handle our work and the courteous way that we handle our customers. If we can't bear that responsibility, we owe it to ourselves and our profession to change our job to one with which we can cope.

County hires catfish for sewage-treatment work

From OMNI Magazine

OFFICIALS in DeKalb County, Georgia, have proposed an interesting alternative to an $85 million sewage treatment plant: catfish.

Instead of installing advanced processing equipment, engineers would pipe the partially treated effluent from the Honey Creek sewer plant into ponds. There, the 36 million gallons of daily sewage would cause algal blooms. Catfish in the ponds would eat the algae. The catfish would multiply. Extra catfish would be caught and used for chicken feed. The cycle would be completed.

Sewage, rich in nutrients, is becoming increasingly promising these days as a future animal food. Since 1975, steers in Denver have been eating a 4- to 12-percent sludge diet with no perceptible ill effects.

In New Mexico, scientists are sterilizing sludge with radiation. The sludge is then used as a soil conditioner and feed supplement for sheep and cattle.

The sterilization solved the potential health hazard of pathogens. Another potential hazard, concentration of metals in animal tissues, could be removed with more restrictions on industrial wastes discharged into sewer systems.

Sludge handling and disposal costs $200 million per year nationally, or 40 percent of all wastewater treatment. But if the sludge were reclaimed and sold as a product, its extra costs would be all but eliminated, studies indicate.

Association is offering rural-water workshops

THE NEWLY-FORMED Montana Rural Water Systems Assocation will be offering 12 more workshops to train managers and operators of rural and small community water systems.

The one-day workshops listed below are also open to persons operating private rural water systems. The workshops include training in valve, hydrant and well maintenance, chlorination equipment, purification of water, billing procedures, water-system financing, and the Safe Drinking Water Act. Consultants will be on hand to talk with operators about individual problems.

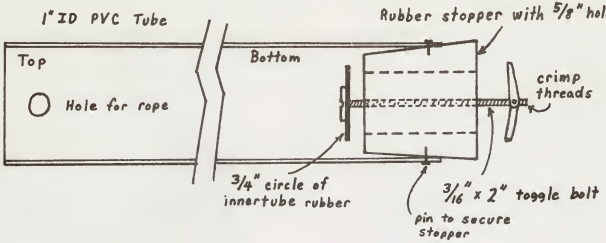
The non-profit Montana Rural Water Systems Association was formed in October 1979 to provide training and technical assistance to water districts, non-profit corporations, associations and other organizations that transport and sell water in rural areas of Montana. Last January 1, the association hired Ray Wadsworth to serve as program manager. He is expected to spend about 75 percent of his time in the field giving technical assistance to rural water systems throughout the state.

The association is working with the state Department of Health and Environmental Sciences and Department of Natural Resources and Conservation, the EPA, Farmers' Home Administration, American Water Works Association, state Well Drillers Association and other agencies to bring the most informative program possible to water-system operators.

Operators may obtain more information about the workshops and the association -- and can be put on the mailing list for association newsletters and bulletins -- by writing the association's office at 1824 10th Ave. South, Suite 4B, Great Falls 59405. The phone number is 454-1151.

TENTATIVE WORKSHOP SCHEDULE FOR YEAR 1980

DATE	REGION	LOCATION
MAY 30	9	BILLINGS
JUNE 13	TO BE DETERMINED	
JUNE 27	1	KALISPELL
JULY 14	TO BE DETERMINED	
JULY 18	3	DILLON
AUGUST 8	2	MISSOULA
AUGUST 29	TO BE DETERMINED	
SEPTEMBER 12	10	MILES CITY
SEPTEMBER 26	4	HELENA
OCTOBER 24	7	MALTA
NOVEMBER 14	8	LEWISTOWN
DECEMBER 12	TO BE DETERMINED	



A handy sampler that's easy to make

A convenient core sampler for a clarifier or sampler for a monitoring well can be constructed easily from parts available around a plant and at a local hardware store.

A one-inch diameter PVC pipe can be used as the body of the sampler, the length determined by the need (15 feet for a clarifier, 4 feet for a well). A clear pipe makes a good clarifier sampler to allow visual observation of the sludge blanket level.

A valve at the bottom of the sampler allows it to fill as it is lowered into the water. The valve then seals as the sample is withdrawn, holding the water in the sampler until it is released manually.

The well sampler can be lowered rapidly with a rope to obtain a sample.

The clarifier sampler must be lowered slowly (½ foot/sec.) to obtain a true core sample.

Acidic water slakes the thirst of little green men

SHORTLY AFTER moving to Columbia, Maryland, Peggy Fenzel, a natural blonde, noticed something odd. Her hair was changing color. Weeks later, her friends confirmed her suspicion: She had green hair.

So did other adults and children with white or light hair in the neighborhood where she lived. In fact, some children, like the main character in the 1948 movie "The Boy with Green Hair", were having hard times in school because their classmates made fun of them. "I thought I was going crazy," Mrs. Fenzel said.

What began as a strange and annoying problem -- "I couldn't wash out the green" -- became more serious once the source of the problem was uncovered. Mrs. Fenzel's housing development is serviced by a private water company that draws its supplies from a large underground well. It turns out the water is highly acidic, so much so it dissolves minute quantities of copper from the plumbing in the houses.

After weeks of drinking and washing with the copper-rich water, Mrs. Fenzel and others absorbed some of the metal into their systems. And copper, when ingested by some people, has the peculiar property of turning their hair color to green.

(Continued on Page 10)

Beavers: a suspected menace to drinking water

PENNSYLVANIA, plagued by the Legionnaires' disease, Three Mile Island, and a rare outbreak of polio in recent years, is contending with yet another menace -- this one possibly caused by beavers.

Beaver droppings "are a prime suspect" in water contamination that sickened 110 persons and forced 17,000 residents to boil drinking water in northwestern Pennsylvania earlier this year. Residents have been hit with abdominal cramps, weight loss and "diarrhea that may last from one day to three weeks," said Bradford city manager Pat Nuzzo. The disorder was first reported in Bradford and surrounding McKean County. "I was really taken aback when they said beavers might be doing it," Nuzzo said.

The disorder can be treated successfully with drugs and is not life-threatening unless it goes untreated or aggravates a pre-existing health problem, state health officials said. In some cases, victims were hospitalized for brief periods.

The real culprit was a water-borne parasite called giardiasis. Authorities believe that the one-celled protozoa can be carried by beaver droppings. The 60-pound beavers and their lodges are found in streams above the Bradford water reservoir. "They'll be live-trapped and tested for the parasite," said a spokesman for the Pennsylvania Department of Environmental Resources. "Beaver dung is one of the common vehicles for transporting this thing."

If the beavers are determined to be a health menace, more of them may be live-trapped and transported elsewhere. Beavers had become virtually extinct in Pennsylvania before 1917 when two were brought into the state from Wisconsin.

In the meantime, all that can be done is a doubling of the chlorine used to purify the drinking water, Nuzzo said. "There isn't any panic," he added. "We hope everyone is boiling their water, but you know how some people are. They say, 'We've been drinking this water for 50 years, and we'll keep on drinking it.'"

Dean Stockwell as The Boy with Green Hair (1948)

Acidic water — little green men

(Continued from Page 9)

The copper discovery has given the Fenzels and other families more than green pates to worry about. Now Mrs. Fenzel says she's concerned about the effects of large amounts of copper on her and her family. Even before the copper discovery, when her baby was eight months old, she had stopped using the water to mix formulas for the child who was always getting sick.

The family has now switched to bottled water for drinking and cooking and uses the well water only for wash. In the meantime, Mrs. Fenzel and her husband are suing the water company and the Maryland Health Department to make the water clean, not green.

Chlorination workshops set

Four chlorination seminars, sponsored by the American Water Works Association and the Water Pollution Control Association in conjunction with the Water Quality Bureau, are scheduled for Montana. They are:

May 14 at the Ramada Inn in Butte. Call Mike Patterson at 792-2311 for information.

May 15 in Missoula at 4B's Restaurant on Hwy. 93 So. Contact Dave Haverfield at 273-2733.

July 16 at Northern Montana College in Havre. For information, call Martha Dow at 265-3257.

July 17 at the Rainbow Hotel in Great Falls. Contact Wade Weakley at 727-5881.

Registration for each workshop begins at 9 a.m. and the seminar will last until 4:30 p.m. Cost will be $7.50 for AWWA and WPCA members, $10 for non-members.

Sludge workshop in June

An activated-sludge workshop will be presented June 5-7 by Envirotech Operating Services at the Great Falls Wastewater treatment plant.

The workshop will include hands-on experience and presentations on process-control procedures, variations of activated-sludge processes, and problems associated with activated-sludge systems.

The cost of the workshop will be $50, including registration and workbooks. Registration forms may be obtained from Dave Brown, plant manager, Great Falls wastewater treatment plant, or from the Water Quality Bureau, Dept. of Health & Environmental Sciences, Capitol Station, Helena 59601. The bureau's phone number is 449-2406.

Annual school in October

The 47th Annual School for Water and Wastewater Operators and Managers will be at Montana State University in Bozeman on Oct. 6-9. The main program will be from Monday through Thursday with certification exams given on Friday, Oct. 10.

Certification exams graded

The March certification exams have been graded. They were to be reviewed by the certification board on April 25 and the results were to be mailed out shortly thereafter. If you took the exam, you should have received your test scores by now. If you haven't, keep an eye on your mailbox.

Wolf Point needs operator

The City of Wolf Point, Montana, is seeking a certified Class II operator for wells, distribution and wastewater. Pay will be commensurate with qualifications and experience. The town has three wells and a new iron filtration system that'll begin operating July 1. Call Bob Flynn, director of public works, at 653-1852 for further information.

. . . and more happy news from Maryland

The mayor of Betterton, Maryland, was killed early this spring when she apparently slipped and fell into a tank of human waste at the municipal wastewater treatment plant.

The sheriff's department said the body of Mayor Monica Myers was found in the plant's sewage tank. The Associated Press article didn't clarify exactly what kind of sewage tank it was. Water-testing equipment was found nearby, a deputy sheriff said.

Town's wastewater to nourish his crops

Farmer and county to combine systems

THE TOWN OF ROBERTS, Montana -- population 210 -- needs a new way to dispose of its wastewater. A south-central Montana farmer needs an irrigation system. So they've joined to combine two systems into one in an alternative wastewater-treatment project that benefits both community and farmer, a system new to Montana. It puts the town's wastewater to work instead of dumping it into a trout stream 53 miles southwest of Billings.

The system, now in the design stage, will pump wastewater from Roberts' existing sewage lagoon and 1½ miles to a storage pond that will be built on farmer Art DeVries' land. DeVries will then pump the water through a new center-pivot spray irrigation system onto a 110-acre field that has never been irrigated.

It's not that DeVries wasn't skeptical about the plan when engineers approached him almost five years ago. Using a town's sewer outflow for irrigation seemed a little crazy -- not to mention the hassle DeVries anticipated in dealing with federal, state and county governments.

"I thought there was a catch to it," the lean, fiftyish DeVries exclaimed. But the more he heard about it, the better it sounded. "My daddy always wanted to put water up here on the table land," he said. "And this seemed to be the best way to do it."

Though the project will cost about $360,000, the Environmental Protection Agency will pay 85 percent of that amount. That money is administered through the Construction Grants Program by the Water Quality Bureau. The federal grants usually foot 75 percent of a town's wastewater-treatment project bill, but an extra 10 percent is added to the grant if the project has an "alternative" design.

Carbon County would have had to pay the remaining 15 percent -- since Roberts is not an incorporated community -- but Art DeVries decided to pay it himself. That gives him certain controls that he wouldn't have had, and besides, he'll be getting sprinkler irrigation for only about $25,000 instead of the $58,000 it would have cost him without the project.

"It was also the least expensive of several wastewater-treatment alternatives for Roberts," said Roger Reich, an engineer for HKM Associates in Billings. Reich came up with the plan after it was discovered that Roberts' sewage lagoon was discharging inadequately-treated wastewater into Rock Creek, which flows out of the nearby Absaroka Range. And Roberts' 14-year-old sewer lines are a mess. Shoddily built, they'll have to be dug up and rebuilt during the construction phase of the new project.

The original plan required the county to buy 20 acres of land from DeVries for the new storage reservoir. But DeVries refused to sell. "It's hell to sell a chunk right out of the middle of your land," he explained. So DeVries signed a 20-year agreement leasing the 20-acre pond site and his 110-acre field to the county.

The EPA, which frowned on leases, balked. For five months, the federal agency mulled over the lease concept. Then they approved it, setting a precedent which may apply to all such projects in the nation.

UNDER THE 20-year agreement, the county will operate and maintain the existing 3-acre lagoon in Roberts, a new pump station at that lagoon,

Art DeVries

and the 6-inch pipe that will run 1½ miles up to DeVries' land.

The farmer will operate and maintain the storage pond and the irrigation system. He will also be allowed to tap Rock Creek with the new pipe and pumping station to supplement the wastewater, which will provide adequate irrigation for only about 65 acres of DeVries' 110-acre field.

But there is a slight drawback, DeVries said. He's required to use all the wastewater the town provides, whether his alfalfa crop needs it or not.

"The system won't provide enough water early in the growing season for more than one hay cutting unless there's plenty of rain," DeVries said. "But by October 1, I have to have the storage pond drawn way down so there'll be room for it to fill up in the winter." Emptying the pond onto his land all at once late in the season could damage the crop, DeVries said.

DeVries still will have to use fertilizer on his field because the wastewater -- which is greatly diluted by groundwater leaking into Roberts' sewer lines -- won't provide quite enough nutrients, such as nitrogen and phosphorus. Although the agreement says he can't raise crops on the field directly for human consumption, the EPA recently decided to allow him to grow wheat. "But I'll probably stick to alfalfa, and maybe rotate it with barley," he said. The barley could be used for hog consumption. Experiments in southern Arizona show that barley irrigated with a 50-50 mixture of pump water and treated municipal wastewater was superior in growth, grain yield and grain quality to barley irrigated with pump water alone.

DeVries is required to wait at least 10 days after sprinkling before he can harvest his crop.

Only the county has the option to renew or abandon the agreement at the end of 20 years. If the option is renewed -- and a sprinkler irrigation system has only a 20-year life span -- DeVries will have to pay for a new sprinkler system.

But the advantages far outweigh the disadvantages. The Water Quality Bureau is satisfied that Roberts' sewage effluent will no longer have an adverse impact on the environment. Sewage will make up only 11 percent of what flows out of the Roberts sewer lines because much groundwater leaks in and will continue to despite the patching job. Many of the solids in the sewage settle out in the existing lagoon. And DeVries' land is at least 50 feet

above the water table, meaning the wastewater will be highly filtered by rocks and soil before it encounters groundwater. No odor problem is anticipated.

So Art DeVries continues to improve the farm his grandfather started in 1906. The town of Roberts gets a wastewater system that won't require a state wastewater discharge permit. And nutrients that spring from a sewer system will be used for growing crops instead of harming a clean Montana stream.

Coors is testing the flatland waters

Water from the Shenandoah Valley has become a precious commodity. Last November, the Adolph Coors Company took a tanker truck full of Shenandoah Valley water back to the Coors brewery in Colorado for testing, in anticipation of building a huge brewery in the valley near Harrisonburg, Va.

Coors plans to make some beer with the water, test it thoroughly, and make a final decision about the brewery. The Harrisonburg site is considered a likely spot, after Coors announced that its other potential site, in North Carolina, was dropped.

Religious and other groups have opposed the project.

Operators' Certification Corner

SAMPLE CERTIFICATION TEST QUESTIONS

1. A treatment plant with a capacity of 2 MGD has a daily flow equal to 2/5 of capacity. 1/7 of the daily flow is industrial waste. How many gallons of industrial waste are treated daily?

2. Water is flowing 2.5' deep with a velocity of 6 ft/sec in a 7'-wide channel. What is the discharge in cfs? gpm?

3. The chlorine demand of an effluent is 10 mg/l. How many pounds are necessary to treat 12 MGD?

4. An oxidation pond has an inflow of 672 gpm with a BOD of 221 mg/l. How many pounds of BOD are added to the pond each day?

5. A trickling filter or activated sludge process causes nitrification, which is

   a. Conversion of nitrogen to ammonia
   b. Conversion of nitrate to nitrogren
   c. Conversion of nitrite to ammonia
   d. Conversion of ammonia to nitrite and nitrate nitrogen?

ANSWERS

1. Daily Flow = 2 MGD x 2/5 = 4/5 MGD

   Industrial Waste = 4/5 MGD x 1/7 = 4/35 MGD = 0.114 MGD

2. Use the formula: $Q = AV$

   A = area = 2.5' x 7' = 17.5 ft^2

   V = velocity = 6 ft/sec

   Q = 17.5 ft^2 x 6 ft/sec = 105 ft^3/sec

   Since gpm = ft^3/sec x 60 sec/min x 7.5 gal/ft^3, then

   gpm = 105 ~~ft^3/sec~~ x 60 ~~sec~~/min x 7.5 gal/~~ft^3~~ = 47,250 gpm

3. 12 MGD x 8.34 lbs/gal x $\frac{10 \text{ (ppm) lb}}{1{,}000{,}000 \text{ lbs}}$ = 12,000,000 gal/day x 8.34 lbs/gal x

   $\frac{10 \text{ lbs}}{1{,}000{,}000 \text{ lbs}}$ = 1001 lbs/day

4. Since mg/l and ppm represent the same volume, then

   221 mg/l = 221 ppm = 221/1,000,000

   672 ~~gal~~/~~min~~ x 1440 ~~min~~/day x 8.34 lbs/~~gal~~ x 221/1,000,000 = 1784 lbs/day

5. d.

A famous name in toilets goes down the drain

The memory of Thomas Crapper, commonly believed to be the British inventor of the flush toilet valve that revolutionized sanitary engineering, has been besmirched again.

This time, it was none other than the Greater London Council which rejected a recent proposal to erect an historical marker at the Crapper residence. The council said it could find no hard evidence of Crapper's achievement, and that patents mentioned in the modern biography of Crapper, titled "Flushed with Pride," could not be located.

The council's historic buildings architect said he "doubted whether Crapper has any special claim to commemoration as a pioneer of sanitary engineering, since he does not figure either in contemporary plumbing textbooks or subsequent histories as an inventor.

"Perhaps his name has stood out among that of many other comparable engineers," the architect said, "by its coincidental association with a slang verb."

Water Quality Bureau
Department of Health
& Environmental Sciences
Capitol Station
Helena, Montana 59601

6270

The Big Sky Clearwater is published quarterly by the Water Quality Bureau of the state Department of Health and Environmental Sciences for water and wastewater treatment operators in Montana.

Editor - Charles Wood

Graphics - Erich Weber

1,500 copies of this publication were produced at a unit cost of 33½¢ per copy, for a total cost of $507.71 which includes $384.65 for printing and $123.06 for distribution.